IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Lon E. Bell
Appl. No.	:	Unknown
Filed	:	Herewith
For	:	EFFICIENCY THERMOELECTRICS UTILIZING CONVECTIVE HEAT FLOW
Examiner	:	Unknown

Group Art Unit Unknown

I hereby certify that this correspondence and all marked attachments are being deposited with the United States Postal Service as first-class mail in an envelope addressed to: United States Patent and Trademark Office, P.O. Box 2327, Arlington, VA 22202, on

July 31, 2003
(Date)

Stephen C. Jensen, Reg. No. 35,556

COMMUNICATION PURSUANT 37 CFR 1.4(a)(2)

United States Patent and Trademark Office
P.O. Box 2327
Arlington, VA 22202

Dear Sir:

Applicant has filed herewith the above-captioned patent application, which is a continuation of Application No. 09/860,725, filed May 18, 2001.

Please note that the specification of the continuation application is not identical to the parent application; a few changes have been made to the original specification. These changes have been made to correct certain typographical errors in the original specification, which are apparent from the context of the disclosure. Thus, no new matter has been added by way of these changes.

These changes that are already incorporated into the specification being filed are detailed below. Additions have been **underlined** and deletions have been ~~**stricken-through**~~.

The section entitled "Reference to Prior Provisional Applications" in the parent application has been changed in the continuation application in the following manner:

Reference to Prior ~~Provisional~~ Applications

This Application is a continuation of Application No. 09/860,725, filed May 18, 2001 and is related to and claims the benefit of the filing date of prior filed U.S. Provisional Patent Application No. 60/267,657, filed February 9, 2001.

The paragraph beginning on page 18, line 20, of the continuation application reflects the following modification from the parent application. Based on the context of this paragraph in view of Figure 11, it is apparent that "904" is a typographical error. Thus, replacing "904" with --1104-- does not add new matter to the continuation application filed herewith.

Figure 11 shows a portion 1101 of a thermoelectric array like that of Figure 10 with a hot side substrate 1102, a cold side substrate 1103, circuitry 1106, holes 1105 through the substrates and circuitry, and a plurality of hollow TE elements 1104. Figure 11 illustrates a heat transfer feature. On particular example is a flow-disturbing feature to mix the flow, such as spiral vanes 1108 placed inside the hollow (e.g., tubular) TE elements 1104. The vanes serve to spin and mix the heat transfer fluid 1109 thereby increasing the heat transfer from the TE elements 1104 to the heat transfer fluid 1109. Another example of a flow-disturbing feature is grooves, like rifling on a gun, placed on the inside of the hollow TE elements 1104.~~904.~~ Any feature that improves heat transfer between the thermoelectric elements and the convective medium as it flows past or through the TE elements, provided that it does not greatly inhibit flow, will suffice.

The paragraph beginning on page 26, line 16, of the continuation application reflects the following modification from the parent application. Based on the context of this paragraph, it is apparent that the character --t-- should have been added in front of the letter "o" to form the word --to--. Thus, no new matter was added by adding --t-- in front of the letter "o" in the continuation application filed herewith.

Many other designs that employ convection are possible. The goal is to have the material to be cooled and/or heated able to convect efficiently the thermal power generated to enhance the operation of that side. Generally, to increase efficiency, the ratio of convection to conduction, δ, should be as large as is allowed by the available thermal power produced. Current and TE geometry are adjusted to meet design needs of both initial cost and operating costs. Solids, liquids and gasses can be used alone, or in combination to transport the thermal power.

The paragraph beginning on page 27, line 1, of the continuation application reflects the following modification from the parent application. Based on the context of this paragraph, it is apparent that the character "*a*" was a typographical error and that the character --*A*-- was intended by the Applicant. Thus, no new matter was added by replacing "*a*" with --*A*-- in the continuation application filed herewith.

It should be noted that the *N*-and *P*-type TE elements are made up of TE materials that have been drawn equal in size and shape. However, they need not be equal in size and shape to achieve optimum efficiency. The preferred requirement for efficient functionality is that;

$$(31) \quad \frac{L_n A_p}{L_p A_n} = \left(\frac{\rho_p \lambda_n}{\rho_n \lambda_p} \right)$$

where;

L = TE element length

A_e = TE element cross sectional area

ρ = material electrical resistivity

λ = material thermal conductivity

Figure 20A has also been modified. The lead-line for element 2004 has been shortened so that it is pointing to the lower sleeve of telescoping sleeves 2003 and 2004. (see paragraph beginning on page 25, line 16.) The length of lead-line for element 2004 in the parent application is typographical error, which is apparent when Figure 20A is viewed in context of the specification. Thus, no new matter has been added as a result of the modification to Figure 20A from the parent application, as reflected in the continuation application filed herewith.

Finally, the claims presented are new.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: July 31, 2003

By: _____

Stephen C. Jensen
Registration No. 35,556
Attorney of Record
Customer No. 20,995
(949) 760-0404

H:\DOCS\AWC\AWC-1886.DOC
031803